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EXAMINER	
RYMAN, DANIEL J	

ART UNIT	PAPER NUMBER
2665	15

DATE MAILED: 02/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/578,564	FIROIU ET AL.	
	Examiner	Art Unit	
	Daniel J. Ryman	2665	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 23 January 2004.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-27 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-27 is/are rejected.

7)☒ Claim(s) 1 and 11 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 23 January 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 12.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. The amendments to page 10 of the specification were not entered because the amendments did not comprise a complete paragraph. Therefore the objections to the specification pertaining to page 10 remain.

2. Applicant's arguments with respect to claims 1-6, 12-14, 17-22 have been considered but are moot in view of the new ground(s) of rejection.

3. Applicant's arguments filed 1/23/2004 have been fully considered but they are not persuasive. On pages 17-21 of the Response, Applicant argues, with respect to claims 7-13, 15, 16, and 23-27, that Floyd "neither describes nor suggests using both an 'average queue size' and 'control function' to calculate the drop probability as recited in the independent claims of the present invention". Examiner, respectfully, disagrees. Floyd discloses "When the average queue size is between the minimum and maximum thresholds, each arriving packet is marked with probability *pa*, where *pa* is a function of the average queue size *avg*" (pages 400-401, section 4). Thus, Floyd explicitly discloses the drop probability is a function of the average queue size. As such, Floyd discloses using an average queue size and a control function to calculate the drop probability where the control function is the function used to calculate the drop probability.

4. On page 21 of the Response, Applicant argues, with respect to claim 23, that Floyd fails to disclose "computer code for selecting a packet drop rate equal in response *to the packet drop probability defined at a point of intersection of the control function and the queue law function*". Examiner, respectfully, disagrees. Floyd teaches calculating a queue size using an equation (queue law function) and then setting the drop probability though the use of the queue size using

a packet marking probability function (control function). Therefore the packet drop rate is selected to be equal in response to the packet drop probability defined at a point of intersection of the control function (packet marking probability function) and the queue law function (average queue size function) where the intersection occurs at the average queue size (pages 400-401, section 4; pages 403-404, section 6; and pages 404-405, section 7).

5. On pages 21-22 of the Response, Applicant argues, with respect to claims 11 and 27, that Floyd fails to disclose "computer code for ascertaining a network function which defines an average queue size based upon a range of server drop rates for the congestion control process". Examiner, respectfully, disagrees. Floyd discloses that the drop rate and the average queue size are interrelated by a function (Floyd: pages 400-401, section 4). Therefore, Floyd discloses a network function, which defines an average queue size based on a range of server drop rates.

6. Given the above arguments, Examiner maintains the rejection of claims 7-11, 15, 16, and 23-27.

Specification

7. The disclosure is objected to because of the following informalities: On page 10, line 2 "Tmin however the" should be "Tmax; however, the". On page 10, line 2 "Tmax the connection" should be "Tmax for the connection".

Appropriate correction is required.

Claim Objections

8. Claim 1 is objected to because of the following informalities: in line 9 "node as for a range" should be "node for a range". Appropriate correction is required.

9. Claim 11 is objected to because of the following informalities: in line 1 "execution a" should be "execution of a". Appropriate correction is required.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. Claims 7-9, 15, and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Floyd et al (Floyd S et al. "Random Early Detection Gateways for Congestion Avoidance". IEEE/ACM Transactions on Networking, IEEE Inc. New York, US. vol. 1, no. 4, 1 August 1993. pages 397-413).

12. Regarding claims 7 and 15, Floyd discloses a method and apparatus for reducing oscillations in queue size in a link using congestion control process that operates in a TCP environment (pages 400-401, section 4 and pages 405-407, section 8, esp. page 406), the method comprising the steps of and the apparatus comprising means for: determining a queue law function (average queue size algorithm) defining an average queue size for a link based at least upon a drop probability characteristic of the congestion control process (pages 400-401, section 4 and pages 403-404, section 6); defining a control function for the queue (packet marking algorithm) which identifies a drop probability of the congestion control process across a range of average queue sizes (pages 400-401, section 4 and pages 404-405, section 7); and dropping packets from the queue at a packet drop rate defined at a point of intersection for the control

function and the queue law function (pages 400-401, section 4; pages 403-404, section 6; and pages 404-405, section 7).

13. Regarding claim 8, referring to claim 7, Floyd discloses in the step of defining the control function, the control function is further defined as a function having no discontinuities (pages 400-401, section 4 and pages 404-405, section 7).

14. Regarding claim 9, referring to claim 7, Floyd discloses that the control function is piecewise linear (pages 400-401, section 4 and pages 404-405, section 7).

15. Regarding claim 16, Floyd discloses an apparatus for reducing oscillations in queue size in a link using congestion control process that operates in a TCP environment (pages 400-401, section 4 and pages 405-407, section 8, esp. page 406), the apparatus comprising: a configuration module for automatically determining control function configuration parameters based upon traffic characteristics (pages 400-401, section 4; pages 403-404, section 6; pages 404-405, section 7; and pages 405-407, section 8); a control function module receiving the control function configuration parameters which define a control function representing a range of packet drop probabilities across a range of queue sizes using the congestion control process and receiving an estimated queue size (pages 400-401, section 4; pages 403-404, section 6; pages 404-405, section 7; and pages 405-407, section 8), the estimated queue size used in conjunction with the defined control function to determine a drop probability (pages 400-401, section 4 and pages 404-405, section 7); and a processor for dropping packets from the queue based upon a packet drop rate selected in accordance with the drop probability, wherein the packet drop rate is automatically updated in response to changing traffic characteristics (pages 400-401, section 4).

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

17. Claims 1-6, 12-14, 17-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Floyd et al (Floyd S et al. "Random Early Detection Gateways for Congestion Avoidance". IEEE/ACM Transactions on Networking, IEEE Inc. New York, US. vol. 1, no. 4, 1 August 1993. pages 397-413) in view of Lauer (USPN 5,528,591).

18. Regarding claims 1 and 12, Floyd discloses a method and apparatus for calculating a drop probability of the packets at a queue in a receiving node includes the steps of and means for: receiving data into a node and storing the data in a buffer, the buffer forming a queue (pages 400-401, section 4); systematically calculating a weight for determining a weighted moving average fullness of the queue in a node (pages 400-401, section 4 and pages 403-404, section 6); calculating the weighted moving average (pages 400-401, section 4); determining an average queue size based upon the weighted moving average (pages 400-401, section 4); and evaluating a control function using the average queue size (pages 400-401, section 4), the control function defining a drop behavior of packets at the node for a range of average queue sizes as defined by a congestion control process executing at the node to determine the drop probability with regard to the average queue size (pages 400-401, section 4) where the function used to derive the probability, *pa,* using the average queue size, *avg*, is broadly defined to be the control function and where the dropping of packets is also broadly defined to be a congestion control process.

Floyd does not expressly disclose controlling a transmission rate of packets issued by a sender in response to a calculated drop probability of the packets at a queue in a receiving node by feeding the calculated drop probability back to the sender. Lauer teaches, in a system for controlling congestion in a network, controlling a transmission rate of packets issued by a sender in response to a feedback information that reflects the ability of downstream nodes to receive data without loss by feeding the calculated rate back to the sender in order to reduce the complexity of the intermediate switches (col. 3, lines 36-67). It would have been obvious to one of ordinary skill in the art at the time of the invention to control a transmission rate of packets issued by a sender in response to a calculated drop probability (ability of a downstream node to receive data without loss) of the packets at a queue in a receiving node by feeding the calculated drop probability back to the sender in order to reduce the complexity of the intermediate switches.

19. Regarding claims 2 and 13, referring to claims 1 and 12, Floyd in view of Lauer discloses that systematically calculating a weight comprises: determining a sampling period for measuring the queue size (Floyd: pages 400-401, section 4; pages 403-404, section 6; pages 405-407, section 8); determining a time period for which samples significantly contribute to the average queue size (Floyd: pages 400-401, section 4; pages 403-404, section 6; pages 405-407, section 8); and determining the weight based upon the sampling period and the time period (Floyd: pages 400-401, section 4; pages 403-404, section 6; pages 405-407, section 8).

20. Regarding claims 3 and 14, referring to claims 1 and 12, Floyd in view of Lauer discloses that evaluating a control function comprises: determining a queue function based upon predetermined system parameters (average queue size algorithm) (Floyd: pages 400-401, section

4); and determining the control function based upon the queue function (packet marking probability algorithm) (Floyd: pages 400-401, section 4 and pages 404-405, section 7).

21. Regarding claims 4 and 20, referring to claims 3 and 19, Floyd in view of Lauer discloses that determining the control function further comprises: determining a threshold value based upon the queue policy (Floyd: pages 400-401, section 4; pages 403-404, section 6; and pages 404-405, section 7); determining a maximum point based upon the threshold value, wherein the maximum point is outside of the queue function (Floyd: pages 400-401, section 4; pages 403-404, section 6; pages 404-405, section 7; and pages 405-407, section 8, esp. page 406, subsection 3); selecting the control function such that when the control function is evaluated a point passes through the maximum point (Floyd: pages 400-401, section 4; pages 403-404, section 6; pages 404-405, section 7; and pages 405-407, section 8, esp. page 406). Floyd in view of Lauer does not expressly disclose selecting a queue policy; however, Floyd in view of Lauer suggests this by disclosing that "the average queue size which makes the desired tradeoffs (such as the tradeoff between maximizing throughput and minimizing delay) depends on network characteristics, and is left as a question for further research" (Floyd: pages 400-401, section 4, esp. page 401, lower half of col. 1), where the queuing policy would be chosen based upon the network characteristics. It would have been obvious to one of ordinary skill in the art at the time of the invention to select a queuing policy in order to make desired tradeoffs between maximizing throughput and minimizing delay depending on network characteristics. Further, Floyd in view of Lauer does not expressly disclose that the method is implemented in a computer program; however, Examiner takes official notice that computer programs are a well-known way to implement methods since computer programs are very flexible.

22. Regarding claims 5 and 21, referring to claims 4 and 20, Floyd in view of Lauer suggests that the queue policy is a delay conservative policy and wherein determining a threshold value comprises: determining a maximum value for the average queue size (Floyd: pages 400-401, section 4; pages 403-404, section 6; pages 404-405, section 7; and pages 405-407, section 8, esp. page 406). Floyd in view of Lauer does not expressly disclose that the method is implemented in a computer program; however, Examiner takes official notice that computer programs are a well-known way to implement methods since computer programs are very flexible.

23. Regarding claims 6 and 22, referring to claims 4 and 20, Floyd in view of Lauer discloses that the queue policy is a drop conservative policy and wherein determining a threshold value comprises: determining a maximum value for the drop probability (Floyd: pages 400-401, section 4; pages 403-404, section 6; pages 404-405, section 7; and pages 405-407, section 8, esp. page 406). Floyd in view of Lauer does not expressly disclose that the method is implemented in a computer program; however, Examiner takes official notice that computer programs are a well-known way to implement methods since computer programs are very flexible.

24. Regarding claim 17, Floyd discloses a method for calculating a drop probability of the packets at a queue in a receiving node includes the steps of: systematically calculating a weight for determining a weighted moving average fullness of a queue in a node (pages 400-401, section 4 and pages 403-404, section 6); calculating the weighted moving average (pages 400-401, section 4); determining an average queue size based upon the weighted moving average (pages 400-401, section 4); evaluating a control function based on a congestion control process executing at the node (pages 400-401, section 4), the control function defining a range of drop probabilities for a range of average queue sizes responsive to the congestion control process

(pages 400-401, section 4) where the function used to derive the probability, *pa*, using the average queue size, *avg*, is broadly defined to be the control function and where the dropping of packets is also broadly defined to be a congestion control process; using the average queue size to determine the drop probability (pages 400-401, section 4). Floyd does not expressly disclose controlling a transmission rate of packets issued by a sender in response to a calculated drop probability of the packets at a queue in a receiving node by feeding the calculated drop probability back to the sender. Lauer teaches, in a system for controlling congestion in a network, controlling a transmission rate of packets issued by a sender in response to a feedback information that reflects the ability of downstream nodes to receive data without loss by feeding the calculated rate back to the sender in order to reduce the complexity of the intermediate switches (col. 3, lines 36-67). It would have been obvious to one of ordinary skill in the art at the time of the invention to control a transmission rate of packets issued by a sender in response to a calculated drop probability (ability of a downstream node to receive data without loss) of the packets at a queue in a receiving node by feeding the calculated drop probability back to the sender in order to reduce the complexity of the intermediate switches. Floyd in view of Lauer does not further expressly disclose that the method is implemented in a computer program; however, Examiner takes official notice that computer programs are a well-known way to implement methods since computer programs are very flexible.

25. Regarding claim 18, referring to claim 17, Floyd in view of Lauer discloses that the computer code for systematically calculating a weight comprises: computer code for determining a sampling period for measuring the queue size (Floyd: pages 400-401, section 4; pages 403-404, section 6; pages 405-407, section 8); computer code for determining a time period for which

samples significantly contribute to the average queue size (Floyd: pages 400-401, section 4; pages 403-404, section 6; pages 405-407, section 8); and computer code for determining the weight based upon the sampling period and the time period (Floyd: pages 400-401, section 4; pages 403-404, section 6; pages 405-407, section 8).

26. Regarding claim 19, referring to claim 17, Floyd in view of Lauer discloses that the computer code for determining a control function comprises: computer code for determining a queue function based upon predetermined system parameters (average queue size algorithm) (Floyd: pages 400-401, section 4); and computer code for determining the control function based upon the queue function (packet marking probability algorithm) (Floyd: pages 400-401, section 4 and pages 404-405, section 7).

27. Claims 10 and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Floyd et al (Floyd S et al. "Random Early Detection Gateways for Congestion Avoidance". IEEE/ACM Transactions on Networking, IEEE Inc. New York, US. vol. 1, no. 4, 1 August 1993. pages 397-413)

28. Regarding claims 10 and 26, Floyd discloses a method for increasing utilization of a link capable of receiving a number of flows into a buffer, the link residing in a TCP network, the link having a congestion control module which drops packets to avoid buffer overflow (pages 400-401, section 4 and pages 401-403, section 5), the method comprising: determining a quantity representative of a capacity for the link (maximum threshold) (pages 400-401, section 4 and pages 404-405, section 7); calculating a quantity representative of the throughput for the link (average queue size) (pages 400-401, section 4 and pages 404-405, section 7); determining the utilization based on the capacity of the link, the throughput of the link, the numbers of flows and

a packet drop probability calculated based on an average queue size and control function associate with a congestion control process of the link (pages 400-401, section 4; pages 401-403, section 5; pages 403-404, section 6; and pages 404-405, section 7). Floyd does not expressly disclose adjusting the packet drop probability to increase the utilization of the link; however, Floyd does suggest this. Floyd teaches that the probability that a packet will be dropped will affect the number of packets dropped (pages 400-401, section 4; pages 401-403, section 5; pages 403-404, section 6; and pages 404-405, section 7). It is implicit that the number of packets dropped affects link utilization. Therefore, adjusting the packet drop probability will affect the utilization of the link. It would have been obvious to one of ordinary skill in the art at the time of the invention to adjust the packet drop probability in order to increase the utilization of the link such that link utilization is maximized. Further, Floyd does not expressly disclose that the method is implemented in a computer program; however, Examiner takes official notice that computer programs are a well-known way to implement methods since computer programs are very flexible.

29. Regarding claim 23, Floyd discloses a method for reducing oscillations in queue size in a node using a congestion control process that operates in a TCP environment (pages 400-401, section 4 and pages 405-407, section 8, esp. page 406), the method comprising: determining a queue law function (average queue size algorithm) defining a range of packet drop probabilities across a range of queue sizes using the congestion control process (pages 400-401, section 4 and pages 403-404, section 6); defining a control function (pages 400-401, section 4 and pages 403-404, section 6) which defines a drop probability for a range of average queue sizes (pages 400-401, section 4 and pages 404-405, section 7); and selecting a packet drop rate equal in response

to the packet drop probability defined at a point of intersection of the control function and the queue law function (pages 400-401, section 4; pages 403-404, section 6; and pages 404-405, section 7). Floyd does not further expressly disclose that the method is implemented in a computer program; however, Examiner takes official notice that computer programs are a well-known way to implement methods since computer programs are very flexible.

30. Regarding claim 24, referring to claim 23, Floyd discloses that the control function is further defined as a function having no discontinuities (pages 400-401, section 4 and pages 404-405, section 7).

31. Regarding claim 25, regarding claim 23, Floyd discloses that the function is piecewise linear (pages 400-401, section 4 and pages 404-405, section 7).

32. Claims 11 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Floyd et al (Floyd S et al. "Random Early Detection Gateways for Congestion Avoidance". IEEE/ACM Transactions on Networking, IEEE Inc. New York, US. vol. 1, no. 4, 1 August 1993. pages 397-413) in view of Silberschatz et al (USPN 6,556,578).

33. Regarding claims 11 and 27, Floyd discloses a method for execution of a congestion control process in apparatus having a queue which resides in a network wherein each data transmission from a sender to a receiver is sent at a transmission rate and the data transmission is acknowledged by the receiver (TCP) (pages 400-401, section 4), wherein if the data transmission is not acknowledged, the sender reduces the transmission rate (TCP) (pages 400-401, section 4), the method comprising: ascertaining a network function which defines an average queue size of the queue based upon a apparatus drop rate (pages 400-401, section 4; pages 403-404, section 6; and pages 404-405, section 7); determining a control function for the apparatus which defines a

given apparatus drop rate for a range of average queue sizes for a given congestion control process (pages 400-401, section 4; pages 403-404, section 6; and pages 404-405, section 7); calculating an equilibrium point based upon the intersection of the network function and control function (pages 400-401, section 4; pages 403-404, section 6; and pages 404-405, section 7); and setting the drop rate of the apparatus to the equilibrium point (pages 400-401, section 4; pages 403-404, section 6; and pages 404-405, section 7). Floyd does not expressly disclose that the method is implemented in a computer program; however, Examiner takes official notice that computer programs are a well-known way to implement methods since computer programs are very flexible. Further, Floyd does not expressly disclose that the apparatus is a server. Silberschatz teaches, in a system for dropping packets in a buffer system, that it is well known to use random early detection on a server in order to apply the benefits of random early detection to a server (col. 1, lines 23-67). It would have been obvious to one of ordinary skill in the art at the time of the invention to have the apparatus be a server in order to apply the benefits of random early detection to a server.

Conclusion

34. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel J. Ryman whose telephone number is (703)305-6970. The examiner can normally be reached on Mon.-Fri. 7:00-5:00 with every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Vu can be reached on (703)308-6602. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Daniel J. Ryman
Examiner
Art Unit 2665

DJR

Daniel J. Ryman

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